


TARDEC Innovation Defies Intense Iraq Heat

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This is my third Tuesday here. I have been stationed at Camp Anaconda, Iraq, for three weeks — it has been dry and stifling hot, 120 degrees Fahrenheit is a good day. We received add-on armor [AoA] kits for our Humvees a few days ago. Riding through the streets in an armored vehicle made me feel safe, but slowly the heat inside the Humvee became unbearable. It started sluggish, making me feel sweaty just like after a good game of basketball. But as the intensity grew, it became agonizing. I can remember sweating more, and my hands became clammy — it was almost hard to breathe. I lost focus for a second and tried to pull it together, the temperature was just too hot. My mission lasted for six hours and the heat wore me down from sheer mental and physical exhaustion.

A Soldier from 2nd Battalion, 256th Brigade Combat Team, prepares his Blue ForceTracker before leaving Camp Victory, Iraq, on patrol. (DOD photo by PH1 Brien Aho.)



Heat is a potential silent killer for our Soldiers. Excessive heat can cause premature fatigue, which can directly lead to Soldier mental process breakdowns. Overheating is especially prevalent in armored environments, increasing the need to cool Soldiers' core body temperatures whenever feasible.

Cooling the hot Humvee became an elevated priority for the Army's Tank Automotive Research, Development and Engineering Center (TARDEC), because of the realization that heat issues have become as serious as enemy fire for Soldiers in theater. Providing solutions to the intense heat stress felt by Soldiers is a rapid U.S. Tank-automotive and Armaments Command (TACOM) Life Cycle Management Command (LCMC) initiative that TARDEC, in collaboration with

the Natick Soldier Center (NSC), U.S. Army Research Institute of Environmental Medicine (USARIEM) and Program Executive Office for Combat Support and Combat Service Support (PEO CS&CSS), have transitioned to the "Cool the Force" program.

"This program has demonstrated mission capability enhancements that Micro Climatic Cooling [MCC] can provide to the Soldier," remarked Arthur H. Adlam Jr., TARDEC Associate Director. "The MCC enhances Soldier survivability and performance while operating in elevated temperature conditions for extended time periods."

During the summer of 2004 with the on-surge of armored vehicles — mainly Humvees — Soldiers were ex-

posed to relentless temperatures in excess of 130 degrees Fahrenheit. TARDEC, working alongside NSC and Foster-Miller Inc., developed a rapid solution to a question posed by PEO CS&CSS: "How can the Army enable Soldiers in [AoA] Humvees to perform longer missions, while alleviating the heat stress brought on by the armored tactical vehicle?"

The existing Red Dot air conditioning units did not provide sufficient cooling, especially when the gunner's turret ring was open. A response was

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The water-filled vests fit under a Soldier's normal body armor and are connected via hoses to the vehicle's MCC subsystem. The chilled water is circulated through the garment. (U.S. Army photo courtesy of TARDEC.)

formulated to show that a Soldier can't properly operate and complete a mission safely with extreme heat conditions. Therefore, a solution needed to be devised that would cool a Soldier's body temperature for extended-duration missions.

Through the leveraging of existing Army systems, the team provided a rapid solution for warfighters. A cooling garment was already being used by the Air Warrior program, which had the ability to cool a Soldier's body temperature without interfering with daily operations. This garment would serve as a supplemental device to the industry-mounted Red Dot air conditioning units that have become standard in AoA military vehicles.

Each Humvee cooling kit consists of four Foster-NSC developed water-filled vests. The vests are designed to fit under each Soldier's normal body armor and are

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connected via hoses to the vehicles' MCC subsystem, which was developed by Foster-Miller. The fungicide-treated water is chilled and circulated through the garment. A hands-free release system allows the Soldiers to quickly detach from hoses for emergency egress. The vest can continue to be worn outside the vehicle. This system can be installed in approximately one hour with a standard mechanics tool set by two Soldiers.

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sion duration and reduce the risks of

heat-related medical problems. "Since we have had the vests, they have become increasingly popular with the platoon — they argue over who gets to wear them," said 1LT(P) David J. Dixon Jr., 18th Airborne Corps. "They wanted me to ask for more."

In January 2005, Foster-Miller received a contract to procure 500 liquid cooling kits. The shipment of 500 liquid cooling vest kits for armored Humvees were sent to Camp Arifjan,



The collaboratively developed liquid vests serve as a supplemental device to the industry Red Dot air conditioning units that have become standard in AoA military vehicles. (U.S. Army photo courtesy of TARDEC.)

Kuwait, during the summer of 2005. In addition, PEO CS&CSS has requested that TARDEC investigate potential cooling units for the Family of Medium Tactical Vehicles and other military tactical vehicles.

"As a ground vehicle systems integration leader, TARDEC has leveraged existing Army technologies and incorporated them onto vehicle platforms that are currently being operated in desert conditions," explained Dr. Richard McClelland, TARDEC Director. "This is a direct response to feedback from Soldiers in the field."

The Humvee cooling kits can be expanded to fit other military and commercial vehicles, and are also being applied to ambulances to treat Soldiers needing medical emergency treatment for heat stress and stroke. Further operational assessments of the cooling kits are being made to gather Soldier performance evaluations on military vehicles.



A hands-free release system allows the Soldier to quickly detach from the hoses for emergency egress. The vest can be worn outside of the vehicle for short periods of time. (U.S. Army photo courtesy of TARDEC.)

The continual positive reception of the liquid cooling vests has been extremely motivational and rewarding for all project engineers. "First of all, thank you for all your support.

The cooling vests worked very well for us, and I believe they will serve the Soldiers well in the future," wrote MAJ Brit S. Britton, Commander, 644th Transportation Co.

Addressing harsh environmental threats to Soldiers was brought to the forefront of Army research because of the joint efforts initiated by TARDEC and NSC. At the onset of the PEO request, TARDEC had been tasked to find out whether there was an actual Soldier-identified need for supplemental cooling systems for armored vehicles, with the first focus on the Humvee Armor Survivability Kit (ASK). Using data from tests on ASK-equipped Humvees performed at Aberdeen Proving Ground, MD, and TARDEC, independent analyses were performed by the U.S. Army Research Laboratory Human Research and Engineering Directorate TACOM and USARIEM.

The analysis assessed the effects of heat on crew and vehicle functionalities. Both of these organizations concluded that there is a definite supplemental cooling requirement needed for Soldiers who perform missions longer than 90 minutes in hot-dry climatic zones, and for missions lasting no more than 60 minutes for hot-humid climatic zones.

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mission duration and improved mental activity for warfighters. The cooling system alleviates Soldier hydration needs and serves as a heat stress treatment, minimizing the patient treatments for heat stress and heat stroke.

This LCMC collaborative solution addresses Soldiers' current needs and benefits both the Current and Future Forces. Together, the Army and industry quickly resolved a need that will foster long-term requirements that are expandable to other

tactical and commercial vehicles. These systems are Soldier friendly and easy to install, leading to good health, greater safety and increased survivability. A Soldier now has the ability to beat the heat in Iraq by wearing one of the liquid-filled cooling vests while an occupant of a military vehicle. Operation "Cool the Force" is underway, and the hot Humvee is finally cooling off.

Editor's Note: TARDEC, NSC and USARIEM were selected for the Collaboration Team of the Year Award at the 2005 Army Acquisition Corps Annual Awards Ceremony for the "Cool the Force" Vehicle Mounted Personal Cooling Program.

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